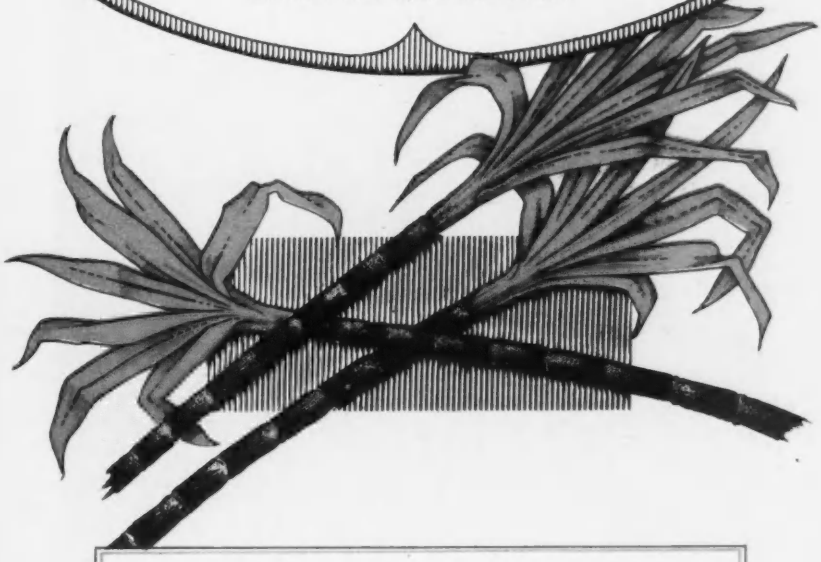
DEPARTMENT OF AGRICULTURE AND STOCK.

The CANE GROWERS' QUARTERLY BULLETIN

ISSUED BY
BUREAU OF SUGAR EXPERIMENT STATIONS
BRISBANE. QUEENSLAND.



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REJUVENATION OF OLD SOILS.

BUREAU OF SUGAR EXPERIMENT STATIONS
BRISBANE

THE
CANE GROWERS'
QUARTERLY BULLETIN

ISSUED BY DIRECTION OF THE
HON. F. W. BULCOCK, MINISTER
FOR AGRICULTURE AND STOCK

1 JULY, 1937

DAVID WHYTE, GOVERNMENT PRINTER, BRISBANE.

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The
Cane Growers' Quarterly
—Bulletin—

VOL. V 1 JULY, 1937 No. 1

Sheep Grazing at the Mackay Experiment Station.

By D. L. McBRYDE.

THE necessity for diverting cane lands from the production of "excess" sugar into more profitable channels has been considered carefully by the Bureau, and canegrowers will probably be interested in the experiment which was undertaken at the Mackay Sugar Experiment Station, Te Kowai, during the spring of 1936. It marks an attempt to determine the value of the Mackay lands for pasture production, in a project which aims at breeding suitable types of cross-bred lambs, and fattening them for the market. The Hon. the Minister for Agriculture (Mr. F. W. Bulcock) was closely associated with the initiation of the plan, and we are indebted to the Minister for his sustained interest and assistance in the work.

A block of 16 acres, situated on the poorest and wettest portion of the Experiment Station, was selected for the purpose, so that the tests are being conducted under rigorous conditions. The block has been subdivided into 8 sections, each 2 acres in area. When the rotation has been established, one section will be under plant cane, one under first ratoons, and the balance in grass, or in process of preparation for pasture or cane. The eight plots will thus have produced two crops of cane in the eight years of the rotation. The object of the trial is thus twofold—firstly, to produce cane, and, secondly, to devote the land to some profitable form of grazing while its fertility is being built up under pasture. The latter phase will be still further assisted by the judicious sowing and ploughing under, or feeding off, of leguminous crops.

At the present time four sections (about 8 acres) are fenced off as a grazing area. Here grasses are very well established—mainly *Panicum muticum* and Guinea grass. Portion of the present grazing area carries a rank growth of these species, while the balance was cut or burned off during 1936. The standover grass is too heavy and thick to permit the sheep to travel through it, and it will be burned off as soon as conditions will permit. Even the new growth grew so rapidly that the sheep were forced to keep to the tracks which they had beaten through it. This has since been mowed to improve conditions.

The area is very wet and attention is being paid to the improvement of drainage conditions. Twice in recent months the entire paddock has been inundated by flood waters. On the first occasion twelve inches of

FIG. 1.—Flock of Merino-Corriedale ewes at Mackay Experiment Station.

water stood on the block for about twelve hours, while again in March there were several inches of water in all parts of the paddock for three days. This second flooding came at the conclusion of a wet period of about two weeks, during which the coats of the sheep were continuously saturated by the showery conditions.

FIG. 2.—Romney Marsh ram at the Mackay Experiment Station.

Twenty-five ewes, 2-, 4-, and 6-tooths, were chosen from the flock of Mr. J. Jones, North Eton, for the purpose of the experiment. These animals are Merino-Corriedales, which were bred and reared on the Eton property. The ram is a stud animal, of the Romney Marsh breed, which was despatched from Southern Queensland to run with the ewes.

Despite the trying conditions which the sheep have passed through, recent inspection by Veterinary Officer Irving, of Rockhampton, proved that there was no sign of foot-rot, worms, or fly-blowing in the mob, and that all of the animals were in excellent condition and quite normal in all respects.

The accompanying photographs were taken early in April, 1937.

The Treatment of Horses for Worms.

AT a recent mass meeting of canegrowers held in Nambour, a very interesting address was delivered by Dr. F. H. S. Roberts on the cure of common ailments of the farm horse. At the request of Mr. W. Kittle, Secretary of the Moreton District Canegrowers' Executive, the following notes were prepared by Dr. Roberts, for the guidance of canegrowers generally:—

Tapeworms.—Starve for 24 hours, then give 2 fluid oz. of turpentine and 1 dram male fern extract in 2 pints of raw linseed oil. Food and water may be given 4 hours after treatment. These dosages are for an animal weighing 1,000 lb. or more and should be reduced for lighter animals.

Stomach Worms.—Starve for 24 hours, then give 2 quarts of a 2 per cent. solution of sodium bicarbonate (baking soda). Thirty minutes after giving this solution, give carbon bisulphide at the rate of 2½ cubic centimetres for every 100 lb. of weight. Food and water may be allowed 4 hours after treatment. The carbon bisulphide is given enclosed in a gelatine capsule as a ball.

Bots and Large Roundworm.—Starve for 24 hours before and for 4 hours after treatment. Give carbon bisulphide at the rate of 2½ cubic centimetres for every 100 lb. of weight in a capsule as a ball. For the large roundworm, the horse may receive, instead of carbon bisulphide, oil of turpentine at the rate of 5½ cubic centimetres for every 100 lb. of weight. The turpentine is mixed with raw linseed oil (1-2 pints according to weight) and given by means of a bottle.

Strongyles or Palisade Worms.—If possible, starve up to 36 hours before and for 4 hours after treatment. Give oil of chenopodium mixed with raw linseed oil. The chenopodium is given at the rate of 1½ cubic centimetres for every 100 lb. of weight. Make sure the linseed oil moves the bowels; if not, give more oil. The chenopodium and linseed oil may be mixed and given with a bottle.

Pin Worms.—Wash out the rectum with an enema of 1-2 gallons of lukewarm water containing 2-4 oz. of sodium bicarbonate. Starve for 36 hours and then give oil of chenopodium as for Palisade Worms.

Lime Spreading Machinery.

By H. W. KERR.

IT is now well-recognised that most of the alluvial soils of North Queensland, as well as certain areas of other classes of soils in these parts, are in need of regular lime applications to destroy the acidity which develops under conditions of high rainfall, and which acts detrimentally to the growth of the cane crop.

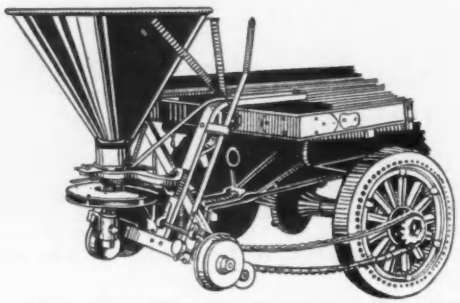


FIG. 3.—Broadcaster Mounted on Motor Truck.

With the realisation of this need, attention has also been given to means by which lime may be spread speedily, evenly, and cheaply. This is particularly the case where the use of burnt lime is desired. This material is very disagreeable to handle, due to its caustic nature, and double handling as is necessary where it is dumped in small heaps to slake before spreading adds to the costs of application. Now that pulverised burnt lime is readily available, the use of a lime spreader becomes possible with any of the several forms of lime.

FIG. 4.—Broadcaster Mounted on Dray.

The usual form of spreader employed by certain northern growers is the well-known hopper mounted on wheels, and by means of the mechanism which it contains the lime is delivered through small feed drills set in the bottom of the hopper. The amount delivered can usually be adjusted over a fairly wide range.

Another type of lime-spreader, which can be accommodated for use with standard farm vehicles, might appeal to those growers who do not feel disposed to purchase a more expensive unit which can be employed

for lime spreading only. Several forms of this Australian-made equipment are shown in the accompanying illustrations (Figs. 3-6). The essentials of the unit may be attached quickly to a dray, wagon, or motor truck. The dumping of the lime on the headland and its transfer to the lime-spreader are thus avoided, as the lime may be spread directly from the vehicle which transports the material from the railway truck.

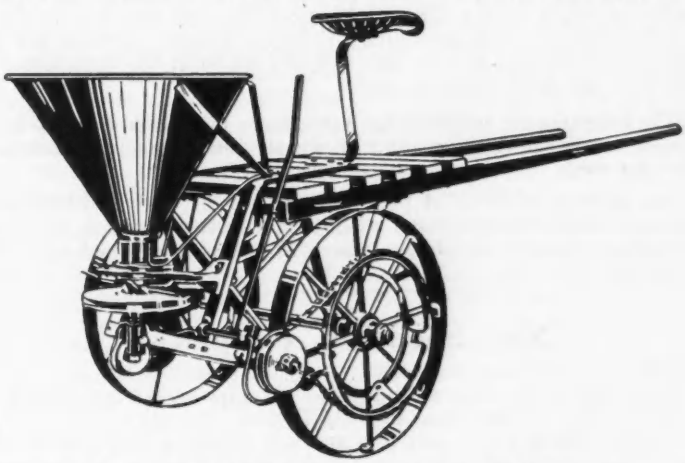


FIG. 5.—Broadcaster Mounted on Steel Wheel Sulky.

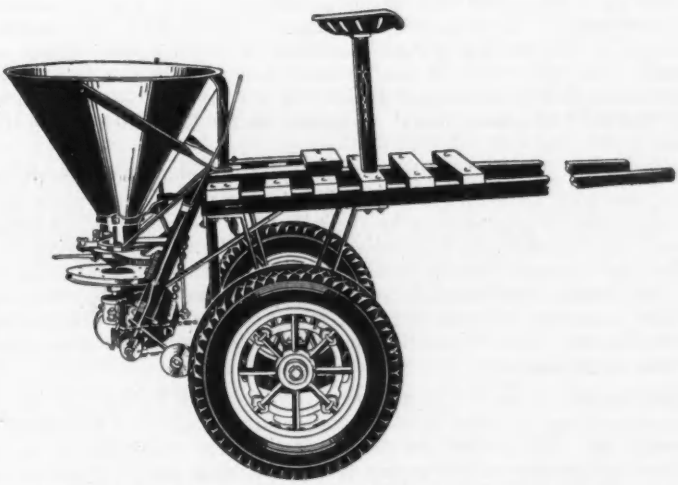


FIG. 6.—Broadcaster Mounted on Sulky with Pneumatic Tyres.

It is claimed by the manufacturers that the spreader is of robust construction, and the lime may be spread over a strip 18 to 20 feet wide. This obviates the necessity for driving close to fences or other obstructions. The range of application varies from less than a hundredweight (when broadcasting superphosphate for example) to a ton or more where

this is desired. Areas of up to 250 acres per day have been covered, with a motor lorry attachment, when pastures were top-dressed with superphosphate. The correct size of chain and sprocket is supplied, in these circumstances, for the particular make of truck being used. It is stated that the gears are totally enclosed in an oil bath, so as to eliminate wear from dust and grit. The one serious objection to this type of broadcaster might be the difficulty of spreading very fine lime in windy weather. However, the spreading of normal crushed lime should not present this difficulty, and for fine powdery material the work would be confined to the early morning hours.

The approximate weight of the attachment for wagon, dray, or truck is 3 cwt., while the complete unit on wheels—either steel or pneumatic tyres—is 6 cwt.

Any grower desirous of obtaining further details regarding these machines should communicate with the Director, Bureau of Sugar Experiment Stations, Brisbane, who will put him in touch with the manufacturers.

New Seedling Varieties.

FARMERS will have observed that the current lists of varieties submitted to the Cane Prices Board for approval or otherwise contain no mention of "Experimental Canes." It was intended when the Cane Prices Act was amended that the term experimental cane should apply to such *areas* of cane as were subject of experimentation under the auspices of the Bureau of Sugar Experiment Stations. At that time, however, particularly in the south, a comparatively large number of canes were still in the experimental stage on unspecified areas, and the expedient of designating certain varieties of experimental canes was adopted. This practice will not be continued and, in the future, mill managements will be informed directly of all areas of cane which are being grown for experimental purposes under agreement with this Bureau.

During the past season a large number of experimental plots of new Bureau seedlings have been set out, and the cane from such plots must be crushed free of any penalty by the miller. It has come to our notice, however, that unauthorised supplies of some of these canes have been obtained by various farmers and planted out without official sanction. Such cane is not experimental cane within the meaning of the Act, and therefore is subject to such penalties as are imposed upon disapproved varieties by the Cane Prices Board. (Penalties up to 10s. per ton of cane may be so imposed.)

Quite apart from the requirements of the Cane Prices Act it is a very unwise thing to make indiscriminate and unauthorised plantings of new seedlings. Naturally, the disease resistance trials cannot all be completed before the variety is put into yield trials, and to plant it out before the disease resistance tests are completed may well be stacking up trouble. An instance of this is the variety Q.2. This cane has been set out in some unauthorised plantings in the gumming disease area at Mulgrave, but in the meantime our tests have shown that it is quite susceptible to this disease, and its growth in the quarantine area will have to be condemned under the Diseases in Plants Act.

A.F.B.

*Rat Investigations.

By W. A. McDOUGALL.

AT this Conference last year Progress Report on Rat Investigations was presented. Actually that report, compiled after a short time in the field and on the advice and writings of men eminent and experienced in this line of work, set out in a general way the proposed method of attacking our rat problem. During the past year no good reasons have come to our notice (either from the results of the work of others or from our own experiments) which warrant materially altering the original programme. It has been continued with and advanced as far as possible under somewhat adverse conditions. References to the chief of these conditions, i.e., the abatement of the epidemic of 1934-35, will be made here and there in this report and they will partially cover several of the points mentioned or inferred in last year's report.

During June-September last year a brief survey of mill areas north of Townsville (Mourilyan and Goondi partially excepted), the Burdekin, and the Central Districts, showed the house rat, the field rat, and the khaki, tree, or "Melomys" rat to be present in all of them. However, all these mill areas with one exception (the Central Districts), and irrespective of whether systematic or sporadic poisoning campaigns had been carried out, suffered comparatively light rat damage last year. In these circumstances it is not possible to state definitely the rat or rats responsible for the severe rat damage during past epidemics in all the districts mentioned above, but field observations and cage experiments indicate that the field rat is by far the most important. So far this rat, without variations, has been found to exist only along the coast from Mackay to some miles north of Mossman. Within this area its full distribution is not known. Past damage to cane tends to connect it, at least superficially, with coastal rivers and creeks. It is also present in the higher and well-grassed portions of marine swamps, and in some districts it damages cane high up on hill sides and against "scrub." In some districts against scrub is the chief locality of damage. So far as is known the common scrub rat of the coastal districts (*Rattus assimilis* and its varieties which extend throughout Eastern Australia) does not eat cane and the field rat does not enter scrub. To date most of the heavy damage in cane against scrub in the Central Districts shows both the field and khaki rats to be present. The khaki rat has a comparatively wide distribution, and the conditions under which it exists vary considerably.

In the furtherance of the subject of rat distribution and as an indication of the lines along which our efforts at control are directed there is a fundamental idea which could be expressed at this juncture. This idea or fact is very well put in the writings of a man who is probably one of the most eminent and experienced authorities on ecology and rodent plagues, we quote from him as follows† :—

> "it is a familiar fact that serious plagues of mice, rats, and other rodents occur from time to time in various parts of the world, often causing a great deal of damage. Readers of Mr. Elton's book will discover that these violent outbreaks are but special cases of a regular phenomenon of periodicity in numbers

* Address to the Pests Boards Conference, held at Meringa, 13th May, 1937.

† From the Editor's Introduction by Julian S. Huxley to "Animal Ecology" by Charles Elton, 1935.

which is perfectly normal for many of the smaller mammals. The animals favoured by climatic conditions embark on reproduction above the mean, outrun the constable of their enemies, become extremely abundant, are attacked by an epidemic, and suddenly become reduced again to numbers far below the mean. When such a number-maximum is so accentuated as to become a plague remedial measures are called for locally, and large sums of money may be spent. Eventually the normal epidemic breaks out and the plague abates. The organisers of the anti-rodent campaign claim the disappearance of the pest as a victory for their methods. In reality, however, it appears that this disappearance is always due to natural causes, namely, the outbreak of some epidemic; and the killing of the animals by man has either had no effect upon the natural course of events, or has delayed the crisis with the inevitable effect of maintaining the plague for a longer period than would otherwise have been the case. In the latter event, it would actually have been a better counter measure to do nothing at all than to spend time and money in fruitless killing. If remedial measures are to be desired, they should be of some special sort. Either they must encourage the development of the epidemic, as by introducing infection amongst the wild population of the pest species; or they may aim at reducing reproduction . . . . ; or they must be aimed at the general ecological status of the species, making it more difficult for it to live and reproduce . . . ."

It cannot be expected, or would it be wise, if those of us who have to conduct campaigns with the often tried and varied conventional methods at our command were convinced of the truth of the above inference, that the methods should be dropped and nothing done. On the other hand, it should not be expected that a research officer will dodge an unpleasant and unpopular fact and go along the well-beaten track thereby deluding himself and others, when there may be possibilities in other directions. This more or less explains our interest in rat distribution, rat behaviour, populations, and breeding under different conditions. During the past year some preliminary work on these subjects has been done. None of it, as yet, is conclusive. Also it is too early to report on the sick rats (and dead ones found above ground) which have been taken in the Central District (no baits present) since October last.

Whilst always bearing in mind that plague conditions and light sporadic infestations might well be treated separately, some poison experiments have been carried out, some attempts at population estimates have been made, and a preliminary investigation of deterrent sprays has been commenced. The results of all these experiments were unsatisfactory—in fact they may be placed, with a large percentage of all rodent work, under the heading of experience and not scientific experimentation.

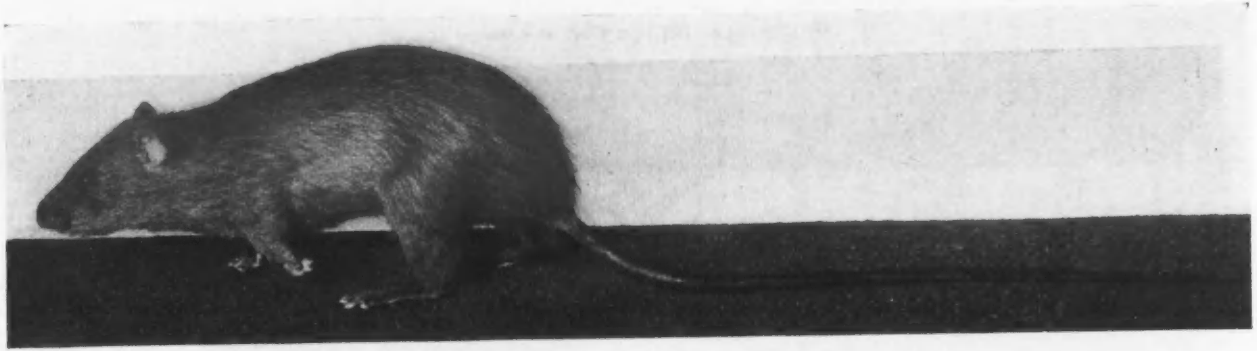
For the possible use of field men the minimum lethal doses of all the common oral rat poisons, combinations of them and some others should be completed by the end of this year.

As this report has been written primarily for the purpose of opening discussion on the subject of rat control no detail has been given and it may be concluded with paragraphs on varieties and rat control work being done in other countries.

a. Rattus culmorum or the Field Rat (¼ natural size).

b. Mesomys littoralis or the Khaki Rat (¼ natural size).

FIG. 7.—The Field rat and the Khaki rat, the two species chiefly responsible for damage to cane in Queensland canefields.



a. Rattus rattus or the House Rat (½ natural size).

b. Rattus norvegicus, the Brown or Sewer Rat (½ natural size).

FIG. 8.—The House rat and the Ship rat are chiefly responsible for damage around stables and farm houses and in towns. The House rat occasionally damages cane but is not a serious pest in canefields. The Brown rat, although present in some sugar towns, has not been found in Queensland canefields.

It has been found that any cane variety may, at times, be severely damaged by rats. The extent of damage depends, amongst other factors, upon rat population, the conditions under which the rats are present in the cane, and the ability of the variety to stand up to rat attack. For example: in rat country in Central Queensland P.O.J. 213 is a badly-damaged variety. It provides excellent cover, its thin barrel will not stand up to many "feeds," and it is soft. Badila, Co. 290, P.O.J. 2725, and Clark's Seedling all provide rat food which is readily accepted by the pests. Fields of P.O.J. 2714 and E.K. 28 where misses were planted up with Clark's Seedling have been inspected. Nearly every such stool was found to be badly rat eaten whilst the others were left alone. Farms where flooding is not experienced and where fields of Badila and P.O.J. 2878 are grown have shown the former to be severely rat damaged and the latter to be comparatively free of bites. On the other hand, P.O.J. 2714, E.K. 28, and P.O.J. 2878, grown on the higher patches of marine swamp, have suffered severe damage Standover crops of these varieties are often attacked by rats, as are D. 1135 and Uba either as ratoons, plant, or standover cane.

As may be known to many of us, at the present time an extensive rat control research programme is under way in the Hawaiian Islands. No doubt in the near future, particularly if another plague soon comes along, we in this country may hear more of hambergers, and rolled oats, &c., as bases for baits. An attempt is also to be made there to learn something of the life history, &c., of the rat with which they are dealing. A comparison of this work with our own along similar lines should be interesting and useful. In several other countries attempted control of the house rat by new materials is in progress. Although not applicable to our field conditions the use of fumigation by "smoke" in parts of India could be noted.

A Convenient and Simple Fire-stick.

The following idea for a cheap and effective fire-stick comes from a northern canegrower:—

A 3- to 4-foot length of ½-inch or ¾-inch galvanized piping is plugged at one end with a piece of suitable cloth, to serve as a wick. This may be attached to a length of wire, like a rifle "pull-through," and is so packed that kerosene poured into the pipe just leaks slowly through. The wick is lighted, and the operator walks along the border of the field dropping flame on the trash.

One bottle of kerosene will suffice to burn several acres of trash. It may be used also on weeds and rubbish generally, and its lightness makes it a handy weapon for the reburning of cane tops which have been raked into rows, and which would probably serve to reinfect neighbouring crops with borers were they not destroyed by fire.

E.H.F.

*The Present Situation Regarding the Giant American Toad in Queensland.

By R. W. MUNGOMERY.

DELEGATES will no doubt remember that during the last conference we were labouring under a ban, imposed by the Federal Government, which restricted the distribution of toads to the Cairns, Gordonvale, Innisfail, and Tully districts. While this ban gave us the opportunity to stock up those districts in great detail, it affected rather harshly those districts where grub damage was not sufficiently widespread and serious to warrant the first toad liberations being carried out there, but where, nevertheless, grubs were serious in localised areas. Growers in these areas subsequently found themselves in the position of desiring a liberation of toads, but that we were unable to make liberations in their areas by virtue of the existence of this ban.

Accordingly we took this matter up further with the Federal Health Department who are responsible for the administration of the quarantine laws. After analysing the excreta of toads collected in this district under a variety of conditions, and dissecting a number of toads caught similarly, we presented to the Health Department the details of what they had eaten, with the result that the ban was finally lifted in September of last year. Since then toads have been liberated in Mossman, Babinda, Ingham, Bambaroo, Giru, Ayr, Mackay, Bundaberg, and Isis districts.

It is pleasing to note that the first Australian-bred generation have commenced breeding, and toadlets are now plentiful in areas where the toads were originally liberated. Egg strings can occasionally be found in the pools along the Little Mulgrave, whilst the same pools harbour thousands of tadpoles. Breeding has been taking place there continuously since last December. Records of breeding have come from other places in the Mulgrave, Hambledon, and Innisfail districts, and toad populations in these places will soon take a sudden rise. We have, therefore, discontinued liberations in these districts ever since toads from the first liberations became mature, as any further liberations at this juncture would not add appreciably to the already existing populations there. We plan to continue extensive liberations in the central and southern districts for some time, so that having once established big populations in those areas there should be no need to make further liberations there next year.

With regard to the usefulness of toads against the Greyback beetle pest, it is much too early to judge their efficacy yet. Certainly they could have had very little or no influence on the beetle pest last year because during the flighting period the number of mature toads at large which would be capable of eating a Greyback beetle would then be too small. However, it is possible that during the coming year, in localised areas, we may gain some idea of their possible effects. I refer particularly to the Little Mulgrave area where toad populations are now dense, and where grubs are now commencing to reassert themselves, and where if no serious check occurs beetle emergence is likely to be intensified at the end of this present year.

* Presented to the Pests Boards Conference held at Meringa, 13th May, 1937.

A Tractor Operated by Suction Gas.

BY G. A. CHRISTIE.

HITHERTO the use of suction or *producer* gas has been confined, more or less, to stationary engines. Attempts have been made to design a suitable generator for use with motor vehicles, and these have proven satisfactory under certain conditions; now a farm tractor which has been designed to use producer gas as the explosive mixture has been manufactured by the Howard Auto Cultivator Works.

The principle of operation is that a mixture of combustible gases is formed when charcoal which has been moistened is burnt in a limited supply of air. In the same way that petrol vapour ignites with a spark when mixed with air of oxygen, so producer gas burns and expands, to provide the power stroke of the engine. In designing the gas generator (see Fig. 9) the manufacturers have endeavoured to combine efficiency in working with economy of space and ease in operation.

FIG. 9.—Illustrating the Tractor operated by Suction Gas.

The tractor, which develops 40 horse-power, is fitted with a 5-feet rotary hoe; this is easily detachable and the tractor may be used as a stationary engine, or any other implement may be attached for cultivation purposes. The hydraulic lift by which the hoe is raised is rapid in action, and thus allows cultivation to be carried closer to headlands than is the case with a slower type of lift. The tractor is fitted with a full set of pneumatic tyres, which enables the tractor to be driven with comfort, and without any adjustment, over highways. It is also claimed that they give a higher general efficiency in operation. The unit is fitted with self-starter and headlights, the power for which is developed through a 12-volt battery.

Before starting any tractor it is necessary to check the various oil and water levels, to grease the several points, &c., which jobs usually occupy about twenty minutes. With the suction gas tractor, it is found

that if the fire is started before commencing this work, gas may be produced by the time the examination is complete. Thus the period elapsing between lighting up and the operation of the engine on gas is not more than thirty minutes. The engine is started on petrol, and is gradually switched over to the gas. This phase occupies only four or five minutes at each starting. The producer is refilled with charcoal at intervals of one hour, and since the engine is not stopped, very little time is taken up for the purpose.

FIG. 10.—Suction Gas Tractor with Rotary Hoe Attachment.

Since its introduction to the Bundaberg area, Messrs. Douglas Bros., of South Kalkie, have kept accurate records of all costs of operation. The tractor and rotary hoe have been used in ratooning cane, cutting and turning under trash and green manure crops, and in normal cultivation of fallow land. The average depth of working (except in ratooning) is 9 to 10 inches of firm soil. In the 233 hours of operation, 140 acres have been cultivated with the following operating costs:—

	£	s.	d.
Charcoal—187 bags at 1s. per bag	9	7	0
Lubricating oil—changed every 40 hours—12 gallons at 5s. 5½d. per gallon	3	5	6
Petrol for starting—9 gallons at 1s. 10½d. per gallon	0	16	11
Gear lubricant	2	9	6
Total	£15	18	11

It will be seen that the running costs per acre with the rotary hoe have been less than 2s. 3½d., while the hourly cost of operation is less than 1s. 4½d., excluding the wages of the driver. From these figures it will readily be appreciated that suction gas may be employed profitably in farm tractors, without any loss of efficiency, where a plentiful supply of cheap wood for charcoal production is available.

*Inefficiency of the Present Quarantine Regulations.

By R. W. MUNGOMERY.

WITH the extended use of aerial transport between Australia and other countries, and the tendency to use aeroplanes of greater speed, the chances of foreign insects gaining entry into our territories are becoming increasingly easy through such quick methods of transport. While the Commonwealth Acts empower the Quarantine officials to fumigate or destroy any plant infested with insects that may be brought into this country by means of aeroplanes or ships, they apparently are powerless to act in the matter of ordering the destruction of insects held mechanically within the cabin of the aeroplane, and which unless destroyed are free to fly away as soon as the cabin is opened up to allow passengers to alight. Obviously a gravid female insect escaping under these conditions could lay her supply of eggs, and if she escaped in a suitable environment the resulting immature stages would form the nucleus of a brand new insect pest for the Commonwealth. The possibility of new insect pests gaining entry into the Commonwealth in this way is therefore only too apparent.

Within the last six months flights by large aeroplanes have been made from New Guinea to Australia, and apparently no recognised landing ground exists for their first landing in Australia. On some occasions the first landing is made at Townsville, whilst at other times a landing is made at Cooktown or on the Port Douglas beach. Now, since New Guinea possesses a very undesirable sugar-cane insect fauna, it is patent that some of these pests may quite easily be brought over to Queensland, and if landings continue to be made in proximity to our canefields, there is little doubt that sooner or later some of these pests will become established. Some of these are not even under efficient biological control in their own country, and the chances of their remaining even minor pests here are consequently remote. Such pests include various moth borers, bugs, and leafhoppers, and these latter as well as being directly dangerous may even carry over with them and be the means of spreading certain virus diseases such as Fiji disease, which would be very devastating in seasons of continued growth such as frequently occur in North Queensland.

Not only does the danger of introducing pests exist from the New Guinea end, but also from the Philippines, Java, and India, and in cases where these pests have alternate hosts they could easily live on some of the reed growth which exists near Darwin, the present landing ground for planes from these countries. The transference by planes of the proposed Imperial Airways flying boat scheme would then be only a matter of time.

In addition to transporting insects injurious to plants, planes may equally effectively bring in those insects which annoy man and domestic animals and transmit serious maladies. This is another important aspect which cannot be overlooked.

Recently I had the opportunity of discussing this question with Mr. C. E. Pemberton, Executive Entomologist of the Hawaiian Sugar Planters' Experiment Station, who stated that in Hawaii soon after the

* Address to the Pests Boards Conference held at Meringa 13th May, 1937.

inauguration of the Pan-American Airways clipper ship service across the Pacific they were very much perturbed by the variety and quantity of insects which were arriving from the Orient in these large planes. From one plane which they examined they got seventy specimens of an injurious rice leafhopper, *Nephotettix* sp., which incidentally is capable of transmitting the rice virus disease of dwarfing. To cope adequately with the new situation which had suddenly arisen, they sent out an entomologist to Midway Island, between Guam and Hawaii where these large planes remain overnight. At the present time these planes are fumigated on arrival there and later cleaned out with a vacuum cleaner, with the result that they are now arriving in Honolulu in a clean condition.

Obviously some such safeguard should be made to ensure that all planes landing in Australia are clean, and I think that a suitably framed resolution should be sent from this Conference calling on the responsible authorities concerned to put into immediate effect adequate measures to prevent the entry into Australia of insect or other pests before irreparable harm is done to Australia's agriculture, livestock, and the health of her people.

Cane Grub Situation.

Cane grub damage has not been particularly alarming in the Northern mill areas this year, and in most cases where large numbers of grubs have been located by trial diggings the areas have been fumigated and the crop saved. Generally speaking, there has been a decrease in infestation in the Innisfail areas this year, but elsewhere there has been a slight increase. In areas where grub damage was practically non-existent during the past two years, and where the pest suffered an almost complete wipe-out, patches of grubs are now apparent, and this sudden increase is somewhat disconcerting when we have in mind the low population level to which climatic conditions previously reduced the pest. In some localities beetles were very difficult to find during last year's flighting period, yet grub-damaged areas are now noticeable. This does not augur well for the success of any beetle collecting campaigns, or the destruction of beetles by raids with flamethrowers or similar methods of attack. The experience on Greenhill plantation supports this view, when, at most, only a few dozen beetles were noticed on each fig tree surrounding the plantation and on the surrounding forest feeding trees, yet the acreage this year infested by grubs was fairly extensive.

The only efficient method of grub destruction in Northern canefields which we can advocate with confidence is soil fumigation, and any small infestations should be kept in check before the pest reaches the same epizootic proportions as in 1934. Obviously it is impossible for the present staff of the Bureau's entomologists to carry on research work and at the same time to advise individual growers concerning methods of pest control. This undoubtedly is the work for an extension officer, and to those mill areas which suffer considerable pest damage and which are at present without the services of a field supervisor we would recommend their earnest consideration of such an officer's appointment, for only in this way can pest control work be co-ordinated and an efficient check maintained to prevent an undue increase in pests throughout those areas.

R.W.M.

Approved Cane Varieties and Experimental Cane.

There appears to be some confusion in the minds of certain canegrowers in respect of so-called "Experimental Cane," in accordance with the definition laid down in "*The Regulation of Sugar Cane Prices Acts, 1915 to 1935.*" Growers are well aware of the necessity for the inclusion of a list of Approved Canes in every Local and Central Board Award, and that the planting of canes not included in such list renders the canegrower liable to a penalty not exceeding 10s. per ton when such cane is milled.

Additional provision is made in the Act to cover certain canes which are not Approved Varieties, but which are undergoing preliminary tests for any specific purposes—such as new seedling canes in farm trials. The Director is given the power to declare any cane which is the subject of experimentation by the Bureau of Sugar Experiment Stations "Experimental Cane," which as such shall be crushed without any deduction being made from the price.

When the amending legislation providing for Approved Varieties and Experimental cane became law, there existed in certain cane areas quite a selection of new varieties undergoing farm trial; and instead of declaring each such plot an area of Experimental cane, they were covered in the Awards by publishing a list of "Experimental Varieties." The time has arrived, however, when it is possible to gauge the value of such new canes, and they have now been either eliminated or added to the list from which the Local Board is required to select its "Approved Varieties." Henceforth the only experimental cane to be recognised is that which is the subject of experimentation by the Bureau, and prior to the harvesting season in each year the Manager of each mill will be supplied with a description of the plots of experimental cane located in the mill area. All other plots of such varieties will be treated as non-approved cane, and will be subject to the full penalty laid down in the Award.

We would also like to make it clear that the list of varieties submitted by the Director to each Local Board in each year is not a list of "Approved Varieties." Only such of those canes from that list as are selected by the Local and/or Central Board for inclusion in the Award are approved, and such as are rejected by the Board become automatically non-approved.

H.W.K.

Liming Ratoon Crops.

Farmers frequently learn that their land is in need of liming, just after they have planted their cane, and they are desirous of making an application of this material after the plant cane has been harvested.

In these circumstances, the lime—either burnt or crushed—may be broadcast over the trash, after harvesting. When the trash is burned the ash and lime are cultivated into the surface soil, and given reasonably moist conditions the benefit will readily be apparent on the first ratoon crop.

If this procedure be followed, the application of a fertilizer mixture containing sulphate of ammonia, or of sulphate of ammonia itself, can be made within a month without danger of loss of ammonia from the fertilizer.

H.W.K.

Wireworm Damage Probable in the Mackay District During 1937.

By W. A. McDOUGALL.

IN the Annual Report of this Bureau for 1935, p. 52, it is stated that "wireworms continue to be both actually and potentially the most serious insect pest of cane in the Mackay area. Climatic conditions during 1934-35 summer were not favourable for the establishment of large larval populations of the chief pest species (*Lacon variabilis* Cand.) over extensive areas, although strikes in several badly-drained hollows and/or ends of fields were considerably damaged by this species." Following the heavy wet season of 1935-36 a warning was issued in the July number of this Bulletin to the effect that 1936 would possibly be the worst "wireworm" year since 1928. Unfortunately for many, subsequent events proved this to be very true. The outcome of these infestations of last spring was a cry for the control of the pests. As was the case immediately following the wide-spread bad strikes of 1928, the old idea of lime as a cure for wireworms was brought up and a desire was expressed by many for "something to put in with the plants to keep the wireworms away."

Following the past heavy wet season this year will, no doubt, be a "wireworm" year approaching the standard of 1928 and last year. Bad strikes can be expected on lands which were water-logged during the past summer. It will not be inopportune to repeat many of the remarks on this pest made in last July's issue of this Bulletin, and to reprint some of the information concerning it given elsewhere.

As has been recommended and *has been proven* by those few who have used the method, adequate drainage of land during the summer rains immediately prior to planting will free the strikes in these lands from heavy misses due to wireworms. Nevertheless, over the past few years, with the exception of some isolated instances, drainage of low-lying farms has not been improved to any great extent in the Mackay Mill areas. In some other instances the attempted drainage has been a big improvement but a partial success only. Again quoting from the 1935 Annual Report of this Bureau, page 52: "the degree and extent of wireworm infestation on unimproved wireworm country has been found to be governed in general by the rainfall of the previous wet season. To a certain extent this applies also to drained land, depending upon the efficiency of the drainage. Thus following an exceptionally wet season, such as 1928, the get-away provided in the improved lands may not prove adequate and wireworm damage may result."

To assist at this time of the year those whose drainage systems are as yet not perfected, those who have not drained, or those who, for one or more of several reasons, cannot get the surplus water from their fields during the wet season, it is considered advisable first to point out some of the common false ideas on the subject of wireworm control in the Mackay area. These false ideas or useless practices are listed as under:—

(1) Bedding up immediately prior to planting does not reduce wireworm attack. Obviously damage by these pests is confined to poorly-drained land, (in this regard note (7)), but the providing of adequate drainage at this time of the year has no effect on already well-established pest populations.

(2) Getting the plants away quickly helps very little in combating the wireworm pest in the Mackay district.

(3) Having the land in good order at the time of planting has no appreciable effect in reducing wireworm damage. These pests, if present in the field, will attack the sett eyes and shoots at normal planting times irrespective of soil condition at the time or the application of any ordinary cultural methods which may be tried.

(4) There are no chemical or mechanical methods known (or rather which can be vouched for) for economically protecting planted cane setts and growing shoots from wireworm damage. Any expenses incurred by efforts in this direction will probably be merely further debits against wireworms.

(5) The use of lime and/or manures, such as superphosphate, considered either as a chemical control or as a help in promoting rapid growth, has been found to be futile in combating the low land wireworm in the Mackay district. This statement is based on evidence from plots with adequate checks, laboratory experiments, and field observations where wireworm attacks were quite authentic.

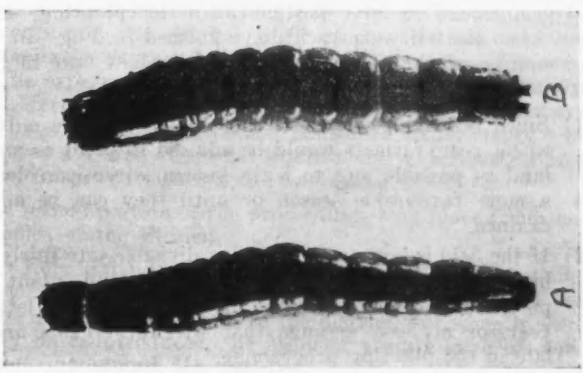


FIG. 11.—Dorsal views of full grown larvae of—(A) *Heteroderes carinatus* Blackburn, × 4; (*b*) *Lacon variabilis* Cand., × 4. The latter is the common wireworm pest of the Mackay district.

(6) The apparent absence of wireworms during ploughing operations is not a reliable guide as to whether the planting will miss attack by the pests. While only a few wireworms may be seen during ploughing, as much as 50 per cent. of the strike may eventually be damaged. Also wireworms may be seen occasionally in any field, whether high or low, and it is difficult to separate the pest species from the comparatively harmless ones by a superficial examination. (See fig. 11). It has been found that the planting and subsequent inspection of trial setts, in the lowest parts of the fields, is the only satisfactory method of finding out, prior to planting, if wireworm pests are present in doubtful fields. The setts are planted in lots of five and are usually soaked before planting in order to help swell the eyes.

(7) The fact that some species of wireworms are found in all fields creates doubt in the minds of some people as to the value of drainage for the control of the wireworm pest in the Mackay district. Some wireworms may be seen in a well-drained field where there are misses; but there are many causes for misses in well-drained country; occasionally those wireworms found on hillsides (they are not the common *L. variabilis* wireworm unless seepage is present) may damage a small patch of planted setts. The owners of farms where there occur these types of misses, most of which are merely incidental, may remark that "they get wireworms on high land so how can drainage help in their control?" Unconsciously, they may be doing their friends and others who have serious wireworm difficulties a good deal of harm by such remarks, which serve to deter low land farmers from advancing along lines which not only will improve their farms but will also give them the only known measure of relief from one of their worst insect pests.

Once the farmer has established the fact, either by planting trial setts or from previous experience in "wireworm" years that wireworms are, or probably are, present in certain of his fields, the next step is to try and obtain as satisfactory strikes as possible, but with due regard to farm economics. At this stage the only method of control which can be recommended is the postponement of planting until late September, when the wireworms will have finished feeding. In considering the economics of the situation the farmer might bear in mind the following points:—

(1) Since it may be expected that this will prove a bad wireworm year, farmers would be advised to plant as much high land as possible and to leave known wireworm blocks until a more favourable season or until they can be adequately drained.

(2) If the field is large enough and is divisible into fairly distinct high land and wireworm-infested low land, plant the top portion at normal planting time and the bottom later in the year, or at least arrange that wireworm fields are placed late in the planting programme.

(3) If a field is eaten out it is of little use replanting until late September at the earliest. The same applies to supplying misses in a patchy stand.

It must be emphasised that the above notes are written in order to assist farmers in making decisions in what will very probably be a bad wireworm year for blocks which were not properly drained prior to the wet season. In its early stages the young wireworm requires extremely wet soil conditions in order to survive, although it can later withstand very dry conditions. Therefore, in order to control the pest the land must be bedded up and drained, *before the commencement of the rainy season*, so that these excessively wet conditions cannot occur and the wireworm will perish in its early stages. This is the only known satisfactory form of control.

Field Day, Bundaberg Sugar Experiment Station, 10th June, 1937.

FARMERS from the sugar growing areas between Gin Gin and Nambour attended the Field Day held at the Bundaberg Experiment Station on the afternoon of Thursday, 10th June last. It was reasonably estimated that the attendance exceeded 300, and an interesting and instructive few hours were spent with the officers of the Bureau in making an inspection of the field and the experiments which are being carried out. It is eight years since the last field day was held at Bundaberg, but the enthusiasm displayed by the farmers on this occasion was such that it can be accepted that field days will again become annual events. A welcome to the farmers and visitors was extended by the Minister for Agriculture and Stock, the Hon. F. W. Bulcock, M.L.A.

Dr. H. W. Kerr (Director) and Mr. A. F. Bell (Assistant Director) of the Bureau of Experiment Stations, delivered addresses dealing with various aspects of the work of the Bureau, while the inspection was made under the guidance of Mr. Norman King, officer in charge of the Station. Informative leaflets had been prepared dealing with the experiments and the general work of the Stations, and copies were made available to the farmers as they commenced the tour of the field. The experiments covered the whole scope of field work, including cultural, fertility and varietal trials, as well as the important work of seedling raising and disease resistance experiments. A field of lucerne was a source of special interest and a demonstration was given in regard to spray irrigation and harvesting.

The formal portion of the proceedings took place from the verandah of the office of the Station.

Dr. Kerr extended a welcome to the Minister, members of the Advisory Board and farmers. He said the field days had been discontinued owing to the conditions in the district, but when it was suggested that they be re-introduced, the Minister readily gave his consent. Dr. Kerr then introduced Mr. Bulcock.

The Minister prefaced his remarks by extending a welcome to the visitors. He said that the system of holding such field days had a great deal to commend it, as it brought farmers into the Experiment Station to see the work that was being carried out by the officers in charge. He said it was a good thing to get the farmers together, as a great deal of the success of the industry depended on complete co-operation between the Department and the growers' organisations. The Minister told the growers that they had the most efficient organisation of farmers in the State. Their organisation had stood the test of many vicissitudes, and the success achieved had been made possible largely by the support of the Bureau of Sugar Experiment Stations.

The Minister said that Dr. Kerr had stated that conditions were very different to-day from a few years ago. No doubt considerable progress had been made, not only in the field but also in the laboratory work, and there was a different system of control. Certain suggestions regarding industry control were made to the Minister and realising how

essential it was that both the millers and growers should have a say, moved towards appointing the Sugar Advisory Board, the members of which were now doing their second round of visits to cane centres, their present meeting in Bundaberg being their second in this town.

Many difficult problems had been dealt with by the Board, and their efforts had been directed towards easing the problems of all concerned, and making the position more tenable. The Minister felt that the growers should know something of the work that was being done and felt that they would more readily appreciate the work that Dr. Kerr and the officers associated with him were doing for the industry.

Mr. Bulcock then went on to deal briefly with the international side of the industry. He said that that aspect of the industry's activities was vitally important. The Premier (Mr. Forgan Smith) attended the conferences held in London, and the Minister said, "I think that the results of the last one have been satisfactory to this country. The results were excellent in my opinion, but it may be necessary to carry out a certain amount of reconstruction as far as our domestic affairs are concerned."

The Minister proceeded that it had always been the policy to leave the domestic affairs of the industry in the hands of the industry itself. Yet at the same time there were the economic problems, which called for the closer co-operation of the officers of the Department and the leaders of the industry. The field day enabled them to see something of the cultural side of the work of the Department. "We want to give you definite economic service," said the Minister. "The matter of the control of diseases is important. Some growers, for what reason I do not know, fail to realise the absolute necessity for disease control measures. There are only a few of them, but they tend to make the work of the officers more difficult. If the industry is to go on developing then it is essential and desirable that you should all co-operate with the officers in taking whatever steps may be deemed necessary to cope with diseases wherever they may occur."

"I sincerely hope that this field day will be the forerunner of many similar gatherings," said the Minister, "and that they will be the means of bringing the officers of the Bureau and the farmers into closer co-operation, so that all the farmers' problems will be those of the officers and and the officers' problems those of the farmers. With such a spirit of service and complete understanding operating, then the future of the industry will be safe. I hope that you will have an enjoyable afternoon."

A vote of thanks to the Minister was moved by Mr. Ben Courtice (Chairman of the District Executive) and supported by Mr. F. W. Axam (President of the Bundaberg Branch of the Australian Sugar Producers' Association). Brief addresses where then delivered by Mr. A. F. Bell (Assistant Director) and Dr. H. W. Kerr (Director).

ADDRESS BY MR. A. F. BELL, ASSISTANT DIRECTOR.

It is an unfortunate fact that people who have to instigate disease control measures are always complaining about something. We seem to be continually reproving the farming community for having done something which we think it ought not to have done, or, more commonly, for not having done something which we consider it should have done.

Really, I would much prefer to spend the time allotted to me in telling you how much I appreciate the manner in which you have rallied round and helped to kill and bury the gumming disease menace, or to say how much I admire the spirit with which you carry on during depressing and adverse seasons such as the present. Unfortunately, however, I must run true to form and urge you along some narrow and uninteresting path of rectitude, and this time my text will be Fiji disease.

Fiji disease has been present in the Bundaberg district for a number of years—certainly since before my association with the Bureau and in the past it has never caused any serious losses. In the past year or two, however, the variety situation has almost entirely changed and is still changing rapidly. The possibilities of P.O.J. 2878 in this district are good, particularly as a standover cane, and you have not been slow to recognise this fact. Indeed earlier in the year Mr. W. G. Gibson informed me that he estimated that 70 per cent. of the plantings in the Bingera Mill area would be P.O.J. 2878. Even if this percentage was not quite attained, the variety is obviously important and valuable.

Now this cane has some so-called "wild" blood in its heritage, its great grandfather being a hardy, prolific growing cane of about the thickness of a lead pencil. It is this wild blood which has conferred on the cane that extra vigour, and, incidentally, its resistance to gumming and mosaic diseases. Unfortunately it has at the same time conferred on it its very high susceptibility to Fiji disease; it can be stated most emphatically that the susceptibility of this variety is far greater than that of the old varieties which you grew here a few years ago, and the same thing applies to the other high numbered P.O.J. canes. It will therefore be understood that the widespread planting of this variety has automatically altered the Fiji disease position also and no risks can be taken with this variety.

During the past year we have found this disease on several farms in the Isis area, it exists at Bingera and here at Kalkie and, in passing, I would remind you that this station property is included in the Kalkie quarantine area. Consequently we cannot at present distribute cane from this station and I would impress upon you the necessity for observing the prohibition against removal of cane which this quarantine imposes. We hope that the ban may be lifted in this vicinity by next year, but it certainly has not been lifted yet.

You will see therefore that this disease is present in the district and so distributed as to quickly become a menace if care is relaxed. It is a very easy disease to recognise once specimens have been seen and I would ask you to inspect the specimens provided before you depart from the station to-day.

Once you can recognise the disease its control on unirrigated farms is easy provided the necessary steps are taken early. On irrigated farms, and on rich river flats, the proposition is more difficult, but, as yet, such represent but a small proportion of the Bundaberg-Isis area. It is spread from diseased to healthy plants by the sugar-cane leaf hopper, a small brown insect about ⅛ inch long, which may often be seen feeding in the heart of the cane top; it feeds on a diseased plant, hops on to a

healthy plant and injects some of the diseased juice into this healthy plant and later on the symptoms of the disease appear. In summer these symptoms may appear as soon as six weeks after infection by the insect, but in autumn and winter their appearance may be delayed for several months.

The important point about this insect is that it becomes comparatively scarce during the winter months and does not again greatly increase its numbers until about December. It follows that there is very little spread of the disease during this period when the leafhopper is depleted in numbers and consequently it is of the greatest importance that all diseased stools should be carefully dug out of the young plant and ratoon cane by the end of November if possible and certainly before the end of December. If there are no diseased plants on which the insects can feed obviously there can be no spread of the disease. But it must be emphasised that these inspections and digging out must be done early in the season.

Several small outbreaks of Fiji disease in this district have been cleaned up by carefully following this procedure, together with plant selection, so that we are not asking you to do anything which we merely hope will be effective, we *know* it will be if carried out properly.

The situation is more difficult to deal with in river flat country and irrigated farms and needs the expense of greater care but the principles are the same.

Fortunately the three thinner canes P.O.J. 213, P.O.J. 234 and Co. 290 are quite resistant to Fiji disease and their growth will help to combat the problem. Q. 813, Oramboo and Korpi are also satisfactorily resistant.

We have stated that unfortunately the wild cane of the East Indies which transmits so many excellent characteristics to P.O.J. 2878, also transmits high susceptibility to Fiji disease. We now know that there are a number of other types of wild cane growing in New Guinea and doubtless there could be found varieties which would pass on the same vigour plus resistance to Fiji disease. It may well be that it would well repay us to visit New Guinea some time in the future and collect some of these canes which were passed by by the old collectors because they were "wild" canes with little sugar and so were useless before the development of modern cane breeding methods.

ADDRESS BY DR. H. W. KERR, DIRECTOR.

Those growers who attended our last general Field Day, held at this station in June, 1929, will doubtless find that the substantial changes which have characterised the Southern Queensland sugar industry generally are also reflected in the conditions obtaining at the Experiment Station. Not one cane variety which was propagated in 1929 will be found on the farm to-day, while at least half a dozen proven, gum-resistant canes will be seen, any of which will produce better tonnages than those formerly harvested.

Unfortunately the droughty conditions of the past summer have left their mark on those crops which have not been watered, but by the same token, the present plight of the district would be disastrous if farmers had still to adhere to the old gummed varieties. I need not dwell on the introduction of the new canes and their value to the Southern districts, this story is already well known to each of you.

As we make our tour of inspection of the station, later in the afternoon, you will see the familiar plot trials, which are intended to supply further information on fertility and cultural matters: the treatments on the individual plots will be pointed out. The larger number of smaller sized plots now employed instead of the single larger plots of former years have been introduced to provide higher accuracy in our conclusions. Though the trials thus lose something as demonstration plots, they provide a definite gain as regards the reliability of our subsequent recommendations.

Farmers will doubtless be most interested in the varietal plots, and here they may study the relative degree of drought resistance exhibited by our newer canes.

The manner in which we are seeking to produce even better yielding and sweeter canes than those at present propagated will be explained when our seedling work is being discussed. Although no new canes of outstanding worth have yet reached the status of possible commercial canes, we have a few of our own propagation which will shortly be placed in field trials with the present standards—Co. 290, and P.O.J. 2878. With the systematic breeding of 10,000 to 15,000 new seedlings each year, it becomes but a matter of time before we will produce such canes as the grower desires for his particular conditions, though it must be admitted that the varieties already named set a standard substantially above that of the older staple canes, such as M. 1900 Seedling and D. 1135.

Our visitors will doubtless agree with us when we state that P.O.J. 2878 is the most valuable cane yet given to the farmers of Southern Queensland. For conditions wet or dry, as an annual or standover crop, as plant or ratoon cane, it provides a tonnage and c.c.s. which is seldom excelled by any other variety. Naturally it shows to best advantage under irrigated conditions, and we would suggest that the greatest value of our function this afternoon lies in the clear-cut demonstration provided by a comparison of cane produced by irrigation with that grown under conditions of natural rainfall. We have consistently maintained that the future of agriculture along the Southern Queensland coast is identified very closely with our ability to develop to the fullest extent the irrigation resources at our command. Nowhere is this better illustrated than with the red volcanic soils of Bundaberg. In themselves some of the best agricultural soils in the entire State, they cannot produce what their natural fertility promises, because of their peculiar droughty character in an area of uncertain rainfall.

The question of overproduction of sugar scarcely enters into this argument. If the canegrowers were able to bring their tonnage production under control—and this is virtually absolutely possible with irrigation—they could grow the desired tonnages on a greatly reduced acreage, at a substantially reduced cost, and be free to utilize their surplus good land in the exploitation of alternative crops which offer high prospects of success, where watering is practicable.

After all any farm peak scheme or other form of crop limitation, however desirable in an attempt to eliminate any suicidal race in production between grower and grower, does not add one penny to the gross income of the district: and only by the economic production of other crops can your area, with its wonderful possibilities, emerge from the

doldrums in which it is now becalmed. Hence we would suggest that you pay careful attention to our demonstration of lucerne production, by spray irrigation, as indicating one field in which there remains considerable scope for development, when combined with a project of stock fattening such as a cross-bred lamb industry. Even where irrigation possibilities are distinctly limited, as is the case with our station, the growth of drought resistant pastures offers possibilities of development, and you will observe our small propagation plots where trials with various grass species are being made.

I do not propose to occupy your time any further in discussing our views or recommendations: I will leave it to you as canegrowers to proceed on your inspectional visit, and to put any questions to our officers who are here to provide any information you may desire, on the various aspects of our Experiment Station work.

INSPECTION OF THE BLOCKS.

Under the direction of Mr. King, farmers were escorted on a tour of inspection of the experimental blocks.

During the walk in the field the notice of the visiting farmers was drawn to the block of young lupins. This is an experiment in a new green-manure crop for winter growth in this district. It also includes the treatment of part of the seeds with inoculum of the bacteria which collect nitrogen from the atmosphere for the use of the plant, and which thereafter becomes available to the succeeding cane crop when ploughed under.

The next block was a plot of mixed P.O.J. varieties in the first ratoon stage, which have received three irrigations since they were harvested last September. Fifty-five tons per acre were cut off the plant crop and the ratoons are estimated at 38 tons per acre. These varieties include some of the lesser known P.O.J. canes and are being tried out elsewhere in variety trials against standard canes.

Farther on were seen two blocks of first year seedlings. An explanation was made of the growing of the seedlings from seed, these canes having been planted as seeds last July. Full stools of cane are now present and these will be selected on the basis of vigour and sugar content in the coming September. Some 6,000 seedlings are planted in these blocks and have been irrigated more or less frequently since planting in the field in October last.

The next block consisted of selected seedlings from the 1935 plantings. Of 6,000 planted that year, only 39 were selected as being sufficiently vigorous and of good sugar content. These 39 were planted out, and at the same time supplies were planted elswhere for disease resistance trials. The selected seedlings will be weighed individually this year and further selections made on the weight of sugar per stool as compared with standard varieties under similar conditions.

Adjoining these selected seedlings was a further selection which was made for experimental purposes. In this case the entire stool was planted out and observation will be made on weights of individual stools, so that a measure may be obtained of the required number of setts to be planted to give a good average of the stool weight. The selected seedlings have received a few waterings during the past nine months and show

the benefit of the restricted irrigation when compared with the next block, which was planted in 1934 as an experiment to find out whether phosphate in the form of meatworks was more beneficial than phosphate in the form of super. Two crops have been harvested to date, but no significant differences have been recorded. This was to be expected on a soil which is naturally not deficient in phosphate. The tour along this headland brought to notice the young hedge of giant privets which had been planted to form a wind break along the southern boundary of the station. In seedling growth the effect of the prevailing winds is sometimes serious and must be eliminated to ensure correct selection.

The next block visited was a permanent trash trial. Started in 1933, this experiment will be carried on for 15 to 20 years. In 24 rows of the trial the trash is conserved on all plant and ratoon crops and is ploughed in at the termination of the final ratoons. On the other 24 lines all trash is burnt either before or after harvesting. To date there has been no appreciable difference in the results, but a noticeable difference in the bacterial population of the soil has resulted. It is not expected that trash conservation will show marked results in less than five years. This block is planted at present with P.O.J. 2725, which has suffered considerably during the past dry season.

The large block next inspected contained a trial in which have been included subsoiling, surface cultivation versus no surface cultivation, and four feet interspacing versus 4 ft. 6 in. interspacing. Although in its second ratoon stage, no results from the various treatments have appeared.

The next trial inspected was an area planted with Co. 290, involving the use or lack of use of potash on the red soils. Certain plots receive no potash, others one increment of this essential fertilizer, and others double increment. It is hoped to determine the effect of continuously withholding the potash on the red soils over a number of years.

The varietal trial visited next is one of interest to local growers. Included therein are most of the newcomers from Java, P.O.J.s 2883, 2940, 2878, 2725, 234, as well as Co. 290. Certain of the lesser known ones show distinct promise and their future will be watched with much interest. This trial is in the plant stage, so that no results are yet available.

The young February plant in the next two blocks represents two distinct experiments. One is a varietal trial between Co. 290 and P.O.J. 213 to find how the varieties compare over a number of years and under a variety of conditions. To date in our farm trials Co. 290 has always been superior, but as a result of requests by growers this experiment has been established. The other block is a fertilizer trial with Co. 290 as the variety. The experiment represents the testing out of a new technique in plot experimentation, which is claimed to give much more information in one year than does the older Latin square type of experiments.

MODERN STABLES.

The direction of the tour then led to the new stable buildings recently constructed on the station. This building, 75 ft. by 30 ft., contains under the one roof six stables, barn for storage of feed, chaff-cutter and engine, fertilizer storeroom and mixing room, workroom, and also implement shed. The building follows a modern design and allows considerable convenience for feeding of stock, etc.

LUCERNE BLOCK.

The spray irrigation system was in operation on the station lucerne block and gave a demonstration of what can easily be obtained on the volcanic soils. Part of the lucerne which has just been cut was raked with the side delivery rake into windrows to illustrate the convenience and saving of time and labour with such an implement. Some standing lucerne also showed the visitors the quality of the winter crop grown. A demonstration of a revolving spray unit was also given. This spray has been exciting much interest among cane growers recently and further details can readily be obtained from the Bureau.

The inspection of two further blocks of cane concluded the station tour. One block represented a trial between Co. 290 and P.O.J. 2878, and also introduced the factor of single and double planting of both these varieties. This experiment was inspired by the fact that several bad strikes of the latter variety were obtained throughout the district when using the cane as an autumn plant crop. The double planting has in the first crop exceeded the single planted plots by a good margin, but ratoon figures are not yet available.

The second trial was a quantitative nitrogen experiment including both P.O.J. 2725 and P.O.J. 2878. In the plant crop, which was well irrigated, the 2878 averaged 50·5 tons per acre, and the 2725, 63 tons per acre. Portion of the 2725, which had not been frosted, gave yields in excess of 85 tons per acre.

Attention was drawn to the new grasses which are being propagated at the station in an endeavour to supplement the very poor pastures in the horse paddock. It is hoped that these include some good, vigorous, drought resistant grasses. Interest was also shown in the seedling raising equipment, the new laboratories and the machinery shed, which houses crushing mill and fibrator.

Technical Bulletins.

In addition to the series of Farm Bulletins which the Bureau has issued from time to time, a number of technical publications have also been prepared as occasion demanded. With the increased activities of our Mill Technology branch, the number of Bulletins of this character which will be issued annually warrants the preparation of further numbers in the form of annual series. This policy was initiated with the commencement of 1937, and to date two Technical Communications have been published, which will interest certain sections of our cane-growers. These are—No. 1, "Irrigation Waters of the Burdekin Delta," by N. G. Cassidy, and No. 2, "The Determination of Fibre in Cane," by H. W. Kerr and N. G. Cassidy.

Canegrowers desirous of obtaining a copy of these Bulletins should apply to the Director of Sugar Experiment Stations, Brisbane. It may be pointed out that these publications are prepared in essentially technical language, while a popular summary of the main conclusions will in each case be presented through the Quarterly Bulletin.

H.W.K.

Conference of Cane Pest Boards.

IN October 1935, in response to an invitation issued by the Advisory Board of the Bureau, the first conference of delegates from Cane Pest Destruction Boards was held in Townsville. At the conclusion of deliberations it was decided that an annual conference would be of distinct benefit to the sugar industry, and a second conference was held at the Meringa Experiment Station in June, 1936. This year's conference was again held at Meringa and took place on Thursday, 13th May. The following delegates were present:—

Mossman	..	Messrs. A. R. Rex and W. H. Crawford.
Hambledon	..	Messrs. A. W. Browne, J. L Boden, C L. Richardson and L M. Smith.
Mulgrave	..	Messrs. W. C. Griffin and M. A. Doolan
Goondi	..	Mr. K. W. McLean.
S. Johnstone	..	Messrs. G. Wilson and J. Henderson.
Mourilyan	..	Messrs. J. McCutcheon and E. H. Fox.
Tully	..	Mr. H. G. Knust.
Macknade	..	Messrs. K. R. Gard and H. Smith.
Victoria	..	Messrs. E. D. Row and D. G. Smith.
Invicta (Ingham Line)		Messrs. H. F. Hecht and J. Rosendahl.
Invicta (Giru)		Mr. G. Stockham.
Kalamia	..	Messrs. A. H. Nuttall and M. T. Norris.
Inkerman	..	Mr H. V. Hansen.
Sarina	..	Mr. J. C. Nicholson.

Bureau Representatives—Messrs. A. F. Bell, R. W. Mungomery, W. A. McDougall. C. G. Hughes, G. Bates and J. H. Buzacott.

Mr. W. C. Griffin was elected to the chair, and the first business of the conference was to resolve itself into a Standing Committee on Pest Control and to adopt a set of rules for the conduct of future meetings. The objects of the Standing Committee are the improvement of the efficiency and economy of cane pest control methods; the discussion, by means of annual conferences, of all technical aspects of cane pest control; the encouragement of research on pest problems; and to act in an advisory capacity to the Bureau of Sugar Experiment Stations. The rules provide amongst other things, that delegates shall elect a chairman at each conference, that delegates shall be nominated by their respective Pest Boards, that the voting delegates from each Board shall be restricted to two, and that officers of the Bureau shall be *ex officio* members of the Committee but shall not vote.

The conference discussed a wide range of subjects, including the following short papers which were presented by members of the entomological staff of the Bureau:—

1. Sugar Cane Beetle Borer Investigations.
2. Rind Hardness of Cane.

3. Cane Grub Situation.
4. Spraying of Feeding Trees.
5. Rat Investigations.
6. The Present Situation regarding the Giant American Toad in Queensland.
7. Inefficiency of the Present Quarantine Regulations.

For the Information of canegrowers generally, certain of these papers are reprinted in this Bulletin (see pages 7, 12, 15). Extensive minutes of the proceedings have also been prepared and copies forwarded to Pest Boards and conference delegates.

A considerable amount of discussion was given over to the beetle borer problem and a demonstration was made with an instrument by means of which the relative rind hardness of cane varieties may be tested. Mr. Buzacott quoted figures to show that there is apparently a close relationship between the rind hardness of a cane and its resistance to borer attack, and the expectation was expressed that a considerable improvement would be brought about by the partial substitution of new varieties in the worst infected centres. The value of greater appreciation of field sanitation was also brought forward.

The conference expressed a wish that the Bureau should continually bear in mind the desirability of improving present methods of soil fumigation. A modified injector had been investigated but it was found that the correction of certain undesirable features of standard types of injector had tended to reduce considerably the speed of fumigation. Various experiments in the direction of improving grub control methods were outlined but it was generally agreed that systematic fumigation presented the only satisfactory method at present available.

The question of rat control was discussed following the reading of Mr. McDougall's paper (see page 7), particularly as to the efficiency of the various types of bait and general opinion appeared to favour thallium treated wheat as the most reliable. Reference was made to the use of a form of mince meat bait or "hamburger" as used in Hawaii but preliminary experiments in Queensland have not proved encouraging. Several delegates advocated the use of poison sprays for the destruction of rat harbourage in headlands; they considered poisoning to be preferable to ploughing, &c., on account of the soil erosion problem in most areas.

The conference took a serious view of the danger of introduction of new insect pests from foreign countries now that fast aerial services were the order of the day (see page 15) and resolved that the question of the provision of adequate quarantine services be taken up with the proper authorities.

At the conclusion of the conference it was resolved that the Committee should meet at the Meringa Station in 1938 on a date prior to the commencement of the crushing season.

A.F.B.

Meeting of Advisory Board.

A MEETING of the Advisory Board of the Bureau of Sugar Experiment Stations, was held at the Sugar Experiment Station, Bundaberg, on 10th June, under the chairmanship of the Hon. F. W. Bulcock, Minister for Agriculture and Stock. All the members of the Board were present. The meeting was held in Bundaberg on this occasion so as to coincide with the holding of Field Day at the Experiment Station and also to give members an opportunity of meeting the growers of the district.

Three matters of paramount importance practically monopolised the attention of members at this meeting. These were disease and variety control with which is associated the work of Pest Boards, the utilisation of by-products in the sugar industry, and the estimates of expenditure of the Bureau for the ensuing year.

The Board exhaustively reviewed the work being performed by the mill technological staff, and as it was felt there was a very great need for the extension of this work it was decided to augment the staff during the ensuing year.

Since the last meeting of the Board, applications were called for the positions of Field Assistant and of Assistant Mill Technologist. While a satisfactory selection could be made from amongst the applicants for the position of Assistant Mill Technologist, members of the Board were struck with the dearth of suitable men for field work in the irrigated areas, and it was consequently decided that one of the Junior Field Assistants should be specially trained in irrigation with a view to the utilisation of his services in the irrigation areas of the Burdekin.

The estimates of expenditure for the next financial year were fully considered by the Board, and were framed with due regard to economy. As finally adopted, they make provision for a broadened programme of investigational work into matters of paramount importance to the industry generally.

The work initiated by the Board last year in relation to fibre investigation will be continued, it being felt that as this question is one of great importance to all sections of the industry, the results obtained last year should be further investigated so that this vexed question might be disposed of once and for all.

The utilisation of by-products was fully considered. It was decided to attempt to assess the amount of molasses available in the State with a view to its utilisation in a solidified form. Mills are to be asked to furnish details of their surplus molasses, and the value of the solidified molasses will be determined by comparison with the market price and nutritional value of other current fodders. The utilisation of bagasse for the manufacture of rayon was also discussed.

Perhaps the most important matter considered by the Board was in relation to the control of disease in regard to cane varieties. The evidence accumulated indicates the possibility of wide spread disease with consequent grave economic loss to the industry and the very obvious necessity for adequate forms of control in the interests of growers

generally. It was pointed out by members, that a small percentage of growers are apparently indifferent to the incidence of disease, and the unfairness of allowing this small percentage to jeopardise the industry was emphasised by all members of the Board. As a result of deliberations it was decided unanimously that such steps as were necessary for the adequate control of disease should be taken without delay, and the Minister as Chairman of the Board was requested to frame legislation providing for adequate control for early presentation to Parliament after consideration by members of the Board. Members considered that it might also be necessary to convene a special meeting of the Board to give consideration to further developments in regard to this most important matter.

The Role of Legumes in Rejuvenating Old Soils.

By H. W. KERR.

IN his speech delivered when opening the Cairns Conference of the Queensland Society of Sugar Cane Technologists, the Minister for Agriculture and Stock (Hon. F. W. Bulcock) made special reference to the need for developing some means of restoring lands on the tropical Queensland coastal plain to a higher plane of fertility without direct recourse to the costly method of applying artificial manures. The Minister alluded to the growing of some form of legume, or possibly mixed pasture with legumes, which would serve to build up the humus and nitrogen content of the land, while also providing a pasture of superior quality to that which customarily occupies such lands.

The value of this recommendation should not be turned lightly aside: indeed, the policy outlined is fundamental to any project of soil rejuvenation. It is well known to agriculturists that legumes possess the interesting property of enriching the nitrogen content of the soil in which they are grown and ploughed under, by virtue of the co-operative effort which is accomplished between the host plant and the bacteria which live in the nodules to which they give rise, on the roots of their host. Legumes commonly employed for this specific purpose in the Queensland cane areas are Poona pea, black cowpea, and Mauritius bean; but there is a long series of leguminous species not so well-known to Queensland farmers but which find considerable favour in other States of the Commonwealth, and in countries overseas. As with other plant species, certain of these are better adapted than others for growth in any particular environment, and extensive experimentation is necessary to enable the most suitable legumes to be selected for a given set of conditions.

On the Queensland coastal lands which are devoted to cane production the particular conditions which are likely to be governing factors in this regard are (*a*) temperature, (*b*) soil acidity, and (*c*) general plant-food and soil moisture deficiencies. Vetches, for example, are generally restricted to the cooler regions, though they may prove successful as a winter crop in the tropics. Lucerne is generally regarded as a legume

which likes a soil rich in lime, and with an absence of any marked degree of acidity; Poona pea, on the other hand, is not so sensitive to a moderate degree of soil acidity, though it does benefit of course from a dressing of lime applied to the soil before seeding. Poona pea will also withstand soil moisture deficiencies without undue distress, and yield satisfactory crops even where the general level of fertility of the soil is low.

In all probability there exist other leguminous species which could be tried to advantage under our conditions, and the Bureau has from time to time received supplies of seed of imported legumes for test purposes. A few years ago it was found for example that one of the "rattle-pod" family, known as *Crotolaria goreensis*, was a specially prolific cropper under the dry conditions of Southern Queensland; but is propagation was not encouraged in cane areas due to the danger of its becoming a noxious weed: It produced seed very freely and our experience suggested that it would be objectionable for short fallowing. However, where a long fallow legume is desired, it offers distinct possibilities, though careful study of its grazing value would be necessary, as certain of the *Crotolaria* are poisonous to stock. This particular legume is receiving considerable attention from the pine-apple industry, where it is an important factor in arresting soil erosion on hillside slopes. It is planted in the interspace between the rows of pines and cut when in full growth.

There is another important feature of legume culture which has been appreciated only in relatively recent years; though the standard species employed in any area may be grown without difficulty, a new legume may be virtually a failure when first planted, though subsequent crops on the same land may be quite successful. An interesting example of this phenomenon is the early attempt to grow lucerne (or "alfalfa" as it is called) in the United States of America. When lucerne was first introduced to certain parts of the country, it was a rank failure, for no apparent cause. Careful study showed that this was due to the absence of nodules on the roots of the plants, suggesting that the particular organisms responsible for their development were absent from the land. Inoculation of the land with soil from a field in which lucerne could be grown successfully was found to overcome the difficulty, while similar results could be accomplished by employing a laboratory culture prepared with organisms which had been expressed from nodules, and sprinkled over the seed before planting. So highly beneficial has this treatment proven that it is now employed as a standard farming practice in that country.

It is found, therefore, that the existence in the soil of the organism capable of effecting nodulation with, for example, lucerne, does not assure success with all other species. On the contrary it has been shown that legumes may be classified in distinct groups, such that one strain of the root-nodule organism will most effectively serve all members of that group, but it is less effective or even quite ineffective with members of other groups. There are many known strains of organisms within the "cowpea group" alone, while at least a dozen cross-inoculation groups of organisms are recognised. It then becomes the problem of the soil bacteriologist to assure himself that the particular strain of the organism is present before the agriculturist attempts to test the value of new legumes in any field. For surety he must culture the desired strain and inoculate the seed with this culture before seeding the field.

So important is this problem that the pathological branch of the Bureau has recently embarked on a full study of the question in connection with the importation of the new legume species which are being tested in the Queensland cane areas. At the present time a wide range of strains are being cultured in the laboratory, and the value of inoculation is also being tested with plantings of even the standard legume species when they are planted for the first time in canelands which have grown only other types of legume. The object of the work is threefold—firstly, to determine the possibility of improving the growth of legumes now grown for green manurial purposes; secondly, to acquire, if possible, more suitable species for this purpose; and thirdly, to explore the possibility of propagating legumes which have also a commercial value, as a means of providing alternative crops for excess sugar cane.

At the present time the growth of lupins in the Southern areas, of lucerne in the central and far northern coastal district, and trial areas of Berseem clover, wild white clover, lespedeza, and several soybean varieties are also planned. Seeds of these species, together with their special bacterial cultures, have been collected from other states of the Commonwealth and from overseas. They will therefore be subjected to careful and thorough trial, and canegrowers should be interested in the outcome of these efforts.

Of particular interest is, perhaps, the soybean, as it has become a crop of high potentialities commercially in the United States of America in recent times. The soybean is indeed one of the oldest cultivated crops. It is described in ancient Chinese literature of nearly 5,000 years ago. and in its value and variety of uses it is still the outstanding legume grown in China and Japan. It is only during the last twenty-five years that the culture of the crop has assumed any importance outside Asia; by 1924, over 5 million bushels of grain were harvested annually in the United States, while in 1935, that country produced a yield of almost 40 million bushels of beans.

The soybean is grown as a summer leguminous annual. The pods are from 1 to 2½ inches long, and contain from 2 to 4 seeds. Stems, leaves and seed pods are covered with short reddish-brown or grey hairs. The root nodules are large and abundant, The stems are branched, and grow from 2 to 3½ feet or more in height. It is grown over a wide range of conditions, from the semi-tropical to the temperate regions. With the exception of cowpea and lespedeza, it is more acid tolerant than any other legume crop grown in American corn belt, but it will, of course, respond well to soil treatment. The beans need a well-prepared seed bed, in order to give them a good start ahead of the weeds. The seed is harvested by the use of the combine, which threshes out the beans and leaves the straw on the land, to be turned under to enrich the soil. The average yield for 1935 in the State of Illinois was 18 bushels per acre.

The beans have a high feed value, for which purpose they are widely employed. The average composition of the beans is as follows:—

	%
Moisture	10
Protein	36
Fat	17
Carbohydrates, etc.	27

They thus differ markedly from other legumes which are usually very much lower in both protein and fat.

The oil which is expressed from the beans may be utilized in the preparation of edible fats, or soaps, while its "drying" properties render it of value in the paint and varnish industry. The meal which remains after the oil is expressed is a valuable concentrate which finds extensive use as a stockfeed.

One of the most recent industrial developments is the utilization of meal as raw material in the preparation of "plastics," which now find wide application in the manufacture of a variety of articles in everyday use. A waterproof-glue for plywoods may also be made from soybean meal, and this product is now in great demand where high tensile strength is demanded. Lastly, the meal is a valuable fertilizer material, due to its high nitrogen content.

These brief notes should indicate the possibilities of this interesting crop. Certain varieties have been grown in trial plots in the neighbourhood of Brisbane in recent years, and some attempt has been made to grow them in the cane areas. To date, the results of the latter trials have been disappointing, and it is our purpose to seek the cause of this failure. Possibly the researches now being undertaken by our pathology staff will indicate the difficulty. Reports show that the crop can be grown in the Philippine Islands, and it would therefore not appear to be due to our high tropical temperatures and humidity. Perhaps it is a question of discovering the correct variety for our particular conditions.

Transportation of Cane for Planting Purposes.

During the spring of 1936 quite a number of Northern cane-growers took advantage of the opportunity to secure Badila cane plants which were propagated at our Meringa Station from Tableland stocks. Subsequently complaints were received respecting poor strikes obtained, due to the delay and handling of the canes in transit, and it was suggested that permission might be obtained from the State Transport Board whereby canes for planting purposes could be carried over main roads without incurring penalties.

The matter was accordingly brought before the notice of the Board, who advise approval of the use by farmers of their own trucks for the collection of seed canes from Gordonvale, and its conveyance to their farms in and around Innisfail. Similar approval is given in cases where farmers do not own motor vehicles, and where they are required to hire a truck for the purpose. The use of road transport in such circumstances will not render the owner liable to register his vehicle as a heavy vehicle.

If growers in similar circumstances desire consideration to be given to any special cases of this character, in other cane areas, we would be pleased to receive their requests and transmit them for the consideration of the State Transport Board.

H.W.K.

DAVID WHYTE, Government Printer, Brisbane.